MA 121 - 003

Monday, September 10

1.1:

$$\lim_{x\to\infty} \frac{f(x)}{g(x)} = ??$$

← DEGR.

← DEGR.

$$f(x) = \frac{2x+1}{5x^2-x+4}$$

$x \to \infty$

(1)
$$\lim_{\boxed{x\to\infty}} \frac{2x+1}{5x^2-x+4} = 0 \checkmark \qquad \text{H.A.: } y=0$$

$$\frac{1}{5} \ldots \frac{2}{10} \ldots \frac{3}{100} \ldots \frac{4}{5000} \ldots \frac{5}{1{,}000{,}000} \ldots$$

$$\lim_{x\to\infty} \frac{\frac{2x}{x^2}+\frac{1}{x^2}}{\frac{5x^2}{x^2}-\frac{x}{x^2}+\frac{4}{x^2}} = \lim_{x\to\infty} \frac{\frac{2}{x}+\frac{1}{x^2}}{5-\frac{1}{x}+\frac{4}{x^2}} = \frac{0}{5}$$

$0 \quad 0 \quad 0 \quad 0$

(2)
$$\lim_{\boxed{x\to\infty}} \frac{2x+1}{3x-4} \quad \text{SAME DEGREE} \quad = \frac{2}{3}$$

$$\lim_{x\to\infty} \frac{\frac{2x}{x}+\frac{1}{x}}{\frac{3x}{x}-\frac{4}{x}} = \lim_{x\to\infty} \frac{2+\frac{1}{x}}{3-\frac{4}{x}}$$

$0 \quad 0$

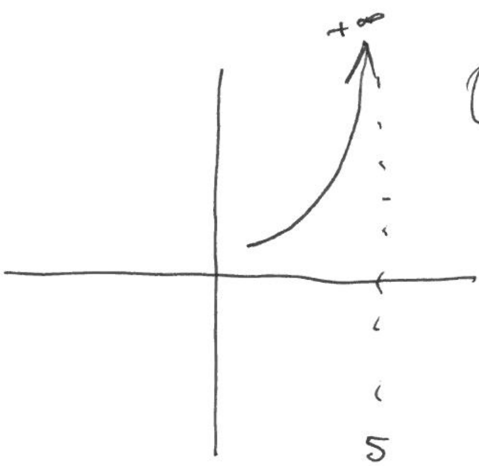
(3) $\lim_{x\to\infty} \dfrac{2x^2+5x-1}{3x+4} = \text{D.N.E.}$

$\dfrac{10}{1} \cdots \dfrac{100}{2} \cdots \dfrac{1000}{5} \cdots \dfrac{1000000}{14} \cdots$

$\lim_{x\to\infty} \dfrac{\frac{2x^2}{x^2} + \frac{5x}{x^2} - \frac{1}{x^2}}{\frac{3x}{x^2} + \frac{4}{x^2}}$

$= \lim_{x\to\infty} \dfrac{2 + \frac{5}{x} - \frac{1}{x^2}}{\frac{3}{x} + \frac{4}{x^2}} = \dfrac{2}{0} \to \text{D.N.E.}$

$\frac{5}{x} \to 0$, $\frac{1}{x^2} \to 0$, $\frac{3}{x} \to 0$, $\frac{4}{x^2} \to 0$



1.3:

AVERAGE RATE OF CHANGE

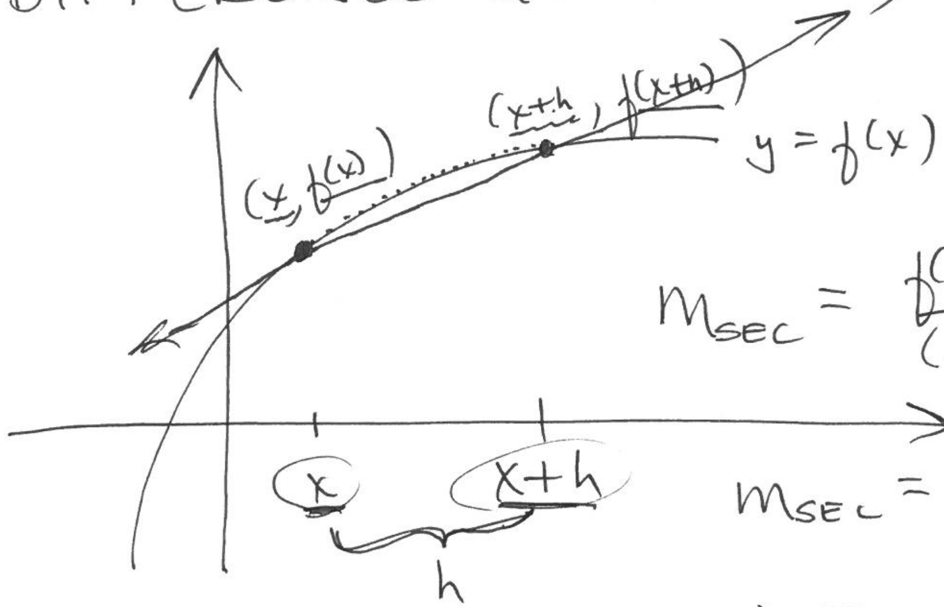
(SLOPE OF THE SECANT LINE) (2pts)

(DIFFERENCE QUOTIENT)

$(2, 1)$

$(5, 17)$

$\frac{17-1}{5-2} = \frac{16}{3}$



x = initial x-value

h = change in x

$$m_{SEC} = \frac{f(x+h) - f(x)}{(x+h) - x}$$

$$m_{SEC} = \frac{f(x+h) - f(x)}{h}$$

polynomial: (parabola)

$$f(x) = 5x^2 - 3x + 1$$

$$m_{SEC} = \frac{\left[5\overbrace{(x+h)^2}^{(x^2+2xh+h^2)} - 3(x+h) + 1\right] - \left[5x^2 - 3x + 1\right]}{h}$$

$$m_{SEC} = \frac{\cancel{5x^2} + 10xh + 5h^2 \cancel{-3x} - 3h \cancel{+1} \cancel{-5x^2} \cancel{+3x} \cancel{-1}}{h}$$

$$m_{SEC} = \frac{\cancel{h}\left[10x + 5h - 3\right]}{\cancel{h}} = \boxed{10x + 5h - 3}$$

$(h \neq 0)$

initial x-value

change in x

$$f(x) = \frac{8}{2x+5}$$

$$\frac{5}{15} - \frac{2}{15}$$

$$\frac{5-2}{15}$$

$$m_{SEC} = \frac{f(x+h) - f(x)}{h}$$

$$= \frac{\frac{8}{2(x+h)+5} - \frac{8}{2x+5}}{h}$$

$$= \left(\frac{8 \quad (2x+5)}{[2(x+h)+5](2x+5)} - \frac{8 \quad [2(x+h)+5]}{(2x+5)[2(x+h)+5]} \right) \cdot \frac{1}{h}$$

$$= \frac{8(2x+5) - 8[\overset{2x+2h}{2(x+h)}+5]}{[2(x+h)+5] \cdot [2x+5] \cdot h}$$

$$= \frac{\cancel{16x} + \cancel{40} - \cancel{16x} - 16h - \cancel{40}}{[2(x+h)+5] \cdot [2x+5] \cdot h}$$

$$= \frac{\cancel{h}[-16]}{[2(x+h)+5] \cdot [2x+5] \cdot \cancel{h}} = \frac{-16}{[2(x+h)+5] \cdot [2x+5]}$$

$(h \neq 0)$

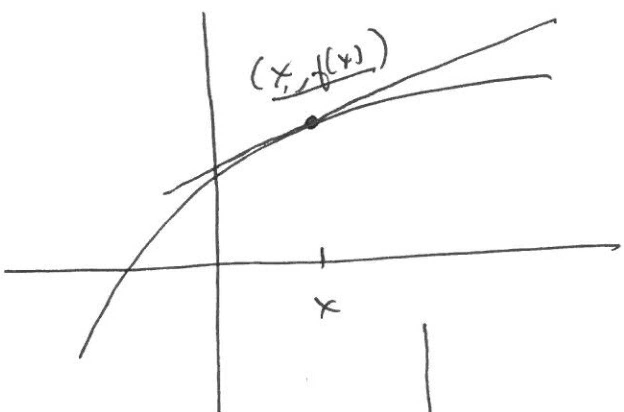
$$m_{SEC} = \frac{-16}{[2(x+h)+5] \cdot [2x+5]}$$

1.4:

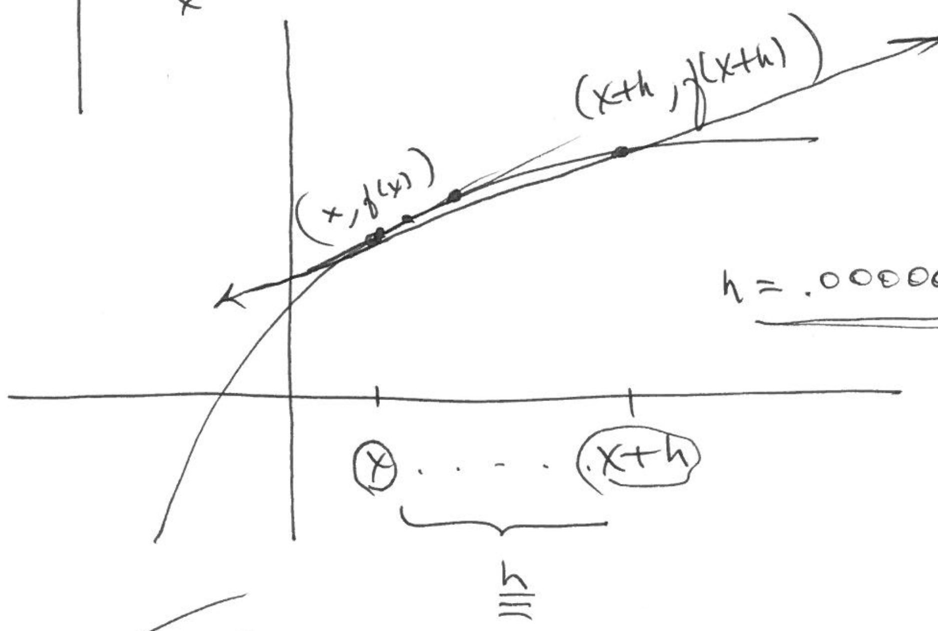
INSTANTANEOUS RATE OF CHANGE

(SLOPE OF THE TANGENT LINE)

(DERIVATIVE OF THE FUNCTION)



$$m_{TAN} = \cancel{\frac{f(x) - f(x)}{x - x}} = \frac{0}{0}$$



h = .0000000000001

$$m_{TAN} = \lim_{h \to 0} \left[\frac{f(x+h) - f(x)}{h} \right] = f'(x)$$

"prime"

DERIVATIVE

(DEFINITION OF DERIVATIVE)

$$f(x) = 5x^2 - 3x + 1$$ ✓

find $f'(x)$; m_{TAN} ; inst. rate of change :

$$m_{TAN} = \lim_{\substack{h \to 0 \\ (h \neq 0)}} \left[\frac{f(x+h) - f(x)}{h} \right] = f'(x)$$

$$= \lim_{h \to 0} \left[10x + \cancel{5h}^{0} - 3 \right]$$ from earlier today $= f'(x)$

$$m_{TAN} = \boxed{\boxed{10x - 3} = f'(x)}$$

$10x - 3 = m_{TAN}$

$10(4) - 3 = m_{TAN}$

$\frac{37}{1} = m_{TAN}$

7

$$f(x) = \frac{8}{2x+5} \qquad \underline{\text{V.A.}}: \underline{x = -5/2} \qquad \underline{\text{H.A.}}: \underline{y = 0}$$

$$\lim_{x\to\infty} \frac{8}{2x+5} = 0$$

$$m_{TAN} = \lim_{h\to 0}\left[\frac{f(x+h) - f(x)}{h}\right] = f'(x)$$

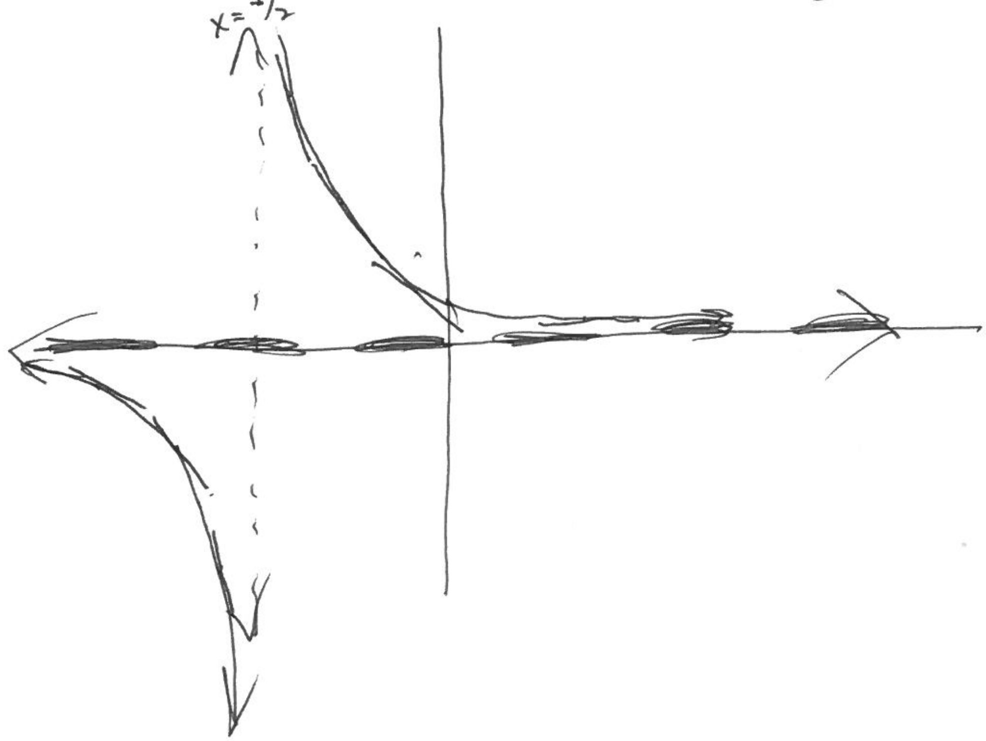
$$= \lim_{h\to 0}\left[\frac{-16}{[2(x+\cancel{h})+5]\cdot[2x+5]}\right] \text{ from earlier today} = f'(x)$$

$h \to 0$

$$= \left[\frac{-16}{[2x+5]\cdot[2x+5]}\right] = \boxed{\frac{-16}{[2x+5]^2} = f'(x)}$$

$f'(x) = m_{TAN}$

$= \text{NEG}$



121 - 003
F '18

Subject: Re: Office hours for MA 121 - 003
From: Courtney Griggs <cgriggs@ncsu.edu>
Date: 9/7/18, 10:34 AM
To: Deepika Chaudhry <dchaudh@ncsu.edu>
CC: John Griggs <jrgriggs@ncsu.edu>, Chuan Xu <cxu9@ncsu.edu>

Hello everyone,

I can hold my office hours 2-4 on Mondays and 10:35-11:35 on Fridays. My office is in SAS 3215.

Best,
Courtney Griggs

On Wed, Sep 5, 2018 at 7:28 PM Deepika Chaudhry <dchaudh@ncsu.edu> wrote:

> Hi Dr. Griggs,
>
> My office hours for MA 121 - 003 are as follows:
> Mondays: 10:45am - 11:30 am at DAN 222
> Tuesdays: 8:00 am - 10:15 am at DAN 214
> Please let me know if there's any more information you need.
>
> Respectfully,
> Deepika Chaudhry
> M.S. Financial Mathematics| North Carolina State University
> B.Tech Electrical Engineering | Indian Institute of Technology, Mandi
> c. +1 (919) 591 4966|Linkedin